

“The Development and Morphology of the Vascular System in Mammals. I. The Posterior End of the Aorta and the Iliac Arteries.” By ALFRED H. YOUNG, M.B., F.R.C.S., and ARTHUR ROBINSON, M.D. Communicated by Sir WILLIAM TURNER, F.R.S. Received January 21,—Read February 10, 1898.

(Abstract.)

Though numerous observations have been made on the development of the systemic aorta and on the aortic arches, including their modifications and transformations at the head end of the embryo, but little attention has been given to the development and modifications of the primitive vessels and the aortic arches at the caudal end.

The statement that the primitive aortæ are prolonged backwards from the dorsal region into the tail, and that, fusing there, they form a caudal aorta—the middle sacral artery—seems to be generally accepted by embryologists. Obviously, if this view is correct, the iliac arteries are not formed from, and do not represent any part of, the primitive aortæ, and they are generally regarded as being segmental in character.

Previous observations on the comparative anatomy of the mammalian aorta and its terminal branches made by one of ourselves in 1891, seemed to show that the true posterior continuation of each primitive dorsal aorta was to be found, not in the middle sacral artery, but in the iliac and hypogastric trunks. It was impossible, however, to arrive at any satisfactory conclusion on the question in the absence of definite and precise information regarding the development of the caudal end of the aorta and its branches.

We therefore commenced a series of observations on the development of the posterior parts of the main systemic vessels in the rat, mouse, ferret, cat, and sheep. In the first three of these the sections examined represent a fairly complete series of the early stages of development. In the cat several embryos of two different stages were referred to, whilst our sections of sheep embryos represented only one stage of development.

In our description of these the embryos of each class are arranged in groups according to the stage of development of their arterial systems, and in each group the general stage of development is indicated by a short statement of the condition of some of the main organs.

On developmental grounds alone the following conclusions, which form a brief summary of the results of our observations, have been arrived at:—

1. The primitive aortæ are paired trunks which pass at either

end of the embryonic area into the vascular network on the wall of the yolk-sac.

2. With the formation of the cephalic and caudal folds each primitive trunk, at first almost straight, is so folded in front and behind that a dorsal and two ventral portions with uniting caudal and cephalic arches are differentiated.

3. The dorsal part of each trunk is modified in the cephalic region into vessels of the head and neck; the remainder of each dorsal portion fuses with its fellow of the opposite side to form the greater part of the systemic aorta.

4. The cephalic or anterior ventral portions are converted into the heart, the ventral part of the arch of the adult aorta, and vessels of the head and neck.

5. The caudal or posterior ventral portions either fuse together to form a common vitello-allantoic stem, as in rodents, or they remain separate and form the ventral parts of the allantoic arteries as in carnivores, ruminants, and man.

6. The ventral and dorsal sections at first are united anteriorly by a cephalic arch and posteriorly by a primary caudal arch. Additional cephalic arches are developed subsequently, to be afterwards utilised in the formation of vessels of the head, neck, and upper extremity and of part of the arch of the aorta of the adult, whilst additional arches in the caudal region may also be formed to be utilised as visceral arteries.

7. The dorsal and ventral extremities of the primary caudal arches remain; the dorsal extremities take part in the formation of the posterior end of the aorta of the adult; the ventral extremities are utilised in the formation of the ventral portions of the allantoic or hypogastric arteries.

8. The middle parts of the primary caudal arches disappear and are replaced by "secondary" caudal arches which lie to the outer sides of the Wolffian ducts. In rodents and man the secondary arches are transformed into the common and internal iliac arteries and the dorsal parts of the hypogastric arteries, whilst in carnivores they are probably transformed into the posterior part of the adult aorta and into the internal iliacs and dorsal parts of the hypogastric arteries.

9. The vessels which are to be looked upon as the posterior continuations of the primitive aorta in the adult in man, rodents, &c., are the common iliac, internal iliac, and hypogastric arteries, and in the carnivores, &c., the internal iliac and hypogastric arteries.

10. The common and internal iliac arteries are not segmental vessels, their branches may be.

11. The middle sacral artery is a secondary branch, probably representing fused segmental vessels.

12. The systemic aorta is formed from the following parts of the

primitive vessels: the anterior ventral aorta, the fourth left cephalic aortic arch, the fused portions of the primitive dorsal aortæ, and in some mammals the fused dorsal ends of the caudal arches.

The permanent adult aorta, in so far as it is formed by the primitive dorsal aortæ, ends posteriorly either at the bifurcation into the two common iliac arteries or at a point corresponding to this bifurcation, when by more extensive fusion involving the dorsal parts of the secondary arches there are no common iliacs, and the external and internal iliac arteries appear to arise directly and separately from the aortæ. In each case the continuity of the primitive aorta is interrupted, and the primary caudal arches are replaced by secondary caudal arches, after which the continuations of the aorta are represented by the vessels into which the secondary caudal arches are ultimately transformed.

Our conclusions are further supported by more extended observations on the anatomy of the posterior end of the aorta, and its terminal branches in mammals, and on the abnormalities they present in man, a general account of which is included in the memoir.

‘Further Observations upon the Comparative Chemistry of the Suprarenal Capsules, with Remarks upon the Non-existence of Suprarenal Medulla in Teleostean Fishes.’ By B. MOORE, M.A., Sharpey Scholar, University College, London, and SWALE VINCENT, M.B. (Lond.), British Medical Association Research Scholar. Communicated by Professor E. A. SCHÄFER, F.R.S. Received January 27,—Read February 10, 1898.

(From the Physiological Laboratory, University College, London.)

In a previous communication* we have shown that the paired segmental suprarenals of Elasmobranchs contain a chromogen which gives the same reactions as that of the medullary portion of the suprarenal capsule of higher vertebrates, while the inter-renal body in the same order of fishes contains no such chromogen. These facts were put forward in support of views previously expressed,† that the segmental bodies corresponded physiologically, as well as morphologically and histologically, to the medulla of mammalian suprarenal, while the inter-renal corresponded to the cortex.

Now it has been already pointed out‡ that the known suprarenal

* ‘Roy. Soc. Proc.,’ 1897 (read December 11, 1897).

† Swale Vincent, ‘Roy. Soc. Proc.,’ vol. 61, p. 64, and *ibid.*, vol. 62, p. 176, and other references (given in these two papers).

‡ Swale Vincent, *loc. cit.*